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ABSTRACT

'Making Work Pay' in a Rationed Labour Market*

We assess the labour supply effects of two 'making work pay' reforms in Germany. We provide evidence in favour of policies that distinguish between low effort and low productivity by targeting individuals with low wages rather than individuals with low earnings. In assessing the policies we account for demand-side constraints by using a double-hurdle model. We identify and decompose the potential bias of labour supply elasticities derived in standard unconstrained models. Although this bias is not significant when assessing policies which mainly target voluntarily unemployed workers (typically secondary earners), it is substantial for policies which affect groups with high shares of involuntary unemployment.

JEL Classification: C25, C52, H31, J22

Keywords: tax-benefit systems, microsimulation, household labour supply, multinomial logit, involuntary unemployment, double-hurdle

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1 Introduction

'Making work pay' policies are usually targeted at people who face the highest risk of unemployment. These measures have been introduced in many OECD countries in recent years. A growing body of literature discusses various issues surrounding policy design and the effectiveness of these policies in alleviating poverty and boosting employment. Most of the discussion has been conducted in the light of the US and British tax credits (cf. Eissa and Hoynes, 2004, and Blundell, 2000). In this respect, some studies have assessed the desirability of these policies when exported to continental Europe (Bargain and Orsini, 2006). Although it is generally ascertained that family based policies may have potential undesired effects on the labour supply of secondary earners, several questions still remain concerning the optimality of the policy structure. In particular, by targeting individuals with low earnings, most 'making work pay' policies seem to combine positive participation effects with negative effects on the population already in employment. This is indeed also a problem encountered in recent evaluations of the German Mini-Job reform, which is an extension of previous exemptions of social security contributions (see e.g., Arntz, Feil, and Spermann (2003) and Steiner and Wrohlich (2005)).

Most ex-ante evaluation studies assess the potential impact of actual and hypothetical in-work transfers by using jointly tax-benefit microsimulation and a structural model of labour supply on national micro data. This framework relies on usual assumptions concerning household rationality, such as static joint utility maximisation in a pure supply side framework. Additionally unemployment is assumed to be voluntarily chosen. Ignoring involuntary unemployment, however, leads to biased elasticities and wrong predictions of the employment effects of a reform. While the bias might not be so important in countries where rationing plays only a minor role (e.g., the US or the UK in recent years), it could seriously distort the results of policy evaluations in countries with severe demand-side constraints, as is the case in Germany.

In this paper, we quantify discrepancies from ignoring involuntary unemployment when evaluating the employment effects of the Mini-Job reform and of an hypothetical in-work policy inspired by the Belgian Employment Bonus. Our contribution is twofold. First, we cover methodological questions about the reliability of predictions based on labour supply models and second, we derive policy conclusions about the design of in-work transfers.

We estimate the risk of involuntary unemployment together with a structural labour supply model (double-hurdle model). The model follows previous work by Blundell, Ham, and Meghir (1987), Bingley and Walker (1997), Duncan and MacCrae (1999), and Hogan (2004), and completes it in several ways. Firstly, a set of questions on job search activity and readiness to take up a work allows us to identify involuntarily unemployed workers. Secondly, we make use of the information about desired hours of unemployed workers to estimate consumption-leisure preferences of all potential workers in the sample. Thirdly, unemployment risk is estimated for both men and women separately and is identified by demand side variables at the regional level and individual characteristics such as education and employment history.

We characterise the triple bias implicit in unconstrained estimations: (i) misspecification, (ii) erroneous freedom of choice (iii) and overstatement of the taste for leisure. Then we compare predictions of the employment effects of the reforms. The Mini-Job reform is conditional on *earnings* and may encourage some workers to optimally reduce their effort to benefit from the maximum level of transfer. This is especially critical for secondary earners due to features inherited from the previous system, namely a tax exemption which generates a substantial threshold effect. In contrast, the Employment Bonus reform is targeted at low *wage rates* and avoids negative reactions at the intensive margin. Moreover, it proves to be more efficient at stimulating participation. Interestingly, the bias on labour supply predictions is not apparent when the effects of a policy (e.g., the Mini-Job reform) are small and concentrate on voluntarily unemployed workers, typically secondary earners. They become substantial with policies (e.g., the Employment Bonus) which generate large responses among primary earners and singles.

The paper is structured as follows. In the next section we describe the Mini-Job reform and a hypothetical reform inspired by the Belgian Employment Bonus. Section 3 presents data, sample selection and the strategy to identify rationed workers. Section 4 introduces the labour supply models whereas Section 5 analyses the estimation results, focusing in particular on the concept of labour supply elasticities in rationed labour markets. Section 6 will discuss the predicted impact of both reforms on employment and Section 7 concludes.

2 Low earnings or low wages?

In this section we present a brief summary of the legislation for low-paid employment in Germany before 2003 and a description of the two reforms under consideration. The main differences between the three situations are summarised in Table 1.

2.1 The Mini-Job reform

Before the recent reform, Mini-Jobs were defined in Germany as employment activity up to a maximum of 15 hours per week and full exemption of employees' social security contributions (SSC) below 325 Euro of monthly gross earnings. Below this income threshold, earnings were also exempt from taxation if the employee had no other income. For those with other (non-labour) income the choice was given between a 20% flat-rate tax and taxation according to the progressive income tax code. Above the threshold, earnings were subject to the normal rate of SSC (about 21%) and taxation set in. Especially for secondary earners in married couples, this meant a drop in net income due to the joint taxation system (they became liable to the marginal tax rate of the primary earner), hence an incentive to remain at a low level of activity.[1]

[1]Between the reforms from 1999 and 2003 further legislation has been temporarily introduced for low-paid employment. Based on the 'Mainzer model' individuals with low income could get subsidies to their SSC (up to 67 Euro for singles) and an increased children's allowance (up to 77 Euro) from March 2002 to March 2003. A single person earning 325 Euro per month was fully exempted from SSC receiving the full subsidy. The subsidy declined linearly beyond this amount to exhaust at earnings of 810 Euro. For couples or singles with children the income range was from 325 to 1620 Euro. Moreover, for people in these jobs, social assistance was not withdrawn at a full rate. A maximum of 15 hours per week was required to be qualified. See Steiner (2003) and Bonin, Kempe, and Schneider (2003)

Following the reform, the maximum hour restriction was abolished and the range of earnings exempted from SSC was expanded up to 400 Euro. To avoid high marginal tax rates immediately above this threshold, a phasing-out of the exemption (or sliding pay-scale) was introduced: between 401 and 800 Euro, earnings are now subject to a modified SSC scheme, starting at 4% and increasing linearly up to 21%. Employees are covered by health insurance but do not acquire any pension rights unless they voluntarily add up to the normal SSC rate (Steiner and Wrohlich, 2005). Income tax below the exemption earnings level is limited to a flat rate of 2% while standard taxation sets in at 401 Euro.[2]

Budget lines give primary insights into the potential impact of reforms on work incentives. We depict how household net monthly income varies with the working hours of secondary earners in couples (Figure 1) and single individuals (Figure 2). The pre-reform situation displays the aforementioned drop in net income for married Mini-Job holders as joint taxation sets in at the 325 Euro threshold (corresponding to around 9 hours/week when paid at 8 Euro/hour). The kink does not disappear with the reform but simply moves further to the right. Net household income increases in a range between 9 and 20 hours. Overall, the Mini-Job reform seems to increase incentive to take up work for secondary earners - especially those with high fixed costs of work - and to reduce hours down to the 400 Euro threshold for those already employed. For single households, potential effects are very weak. Net income increases only slightly when working less than 20 hours per week. The reason for such small net gains is typically that for this range of earnings, single Mini-Job holders are still in the social assistance range: most of the means-tested social benefit is withdrawn as net income increases, making the budget line much flatter than in the case of secondary earners.

2.2 The Employment Bonus

This reform is inspired by the Belgian Employment Bonus implemented in 2004 which consists of a substantial increase in the rebates on low-wage workers' SSC. In Belgium, it has replaced the 2001 tax credit on low earnings which, like the Mini-Job reform, rather targeted part-time employment. The Employment Bonus depends on working time so that a given worker will receive twice as much if working full-time rather than half-time. More importantly, the amount of Bonus payments are conditional on the wage rate rather than on the level of earnings so that higher wage workers cannot reduce effort in order to become eligible. Full subsidy is paid up to a wage limit of 1,210 Euro/month, expressed in full time equivalent income. Above this threshold, it is phased out at a taper rate of 17.8% and is fully exhausted at a full time equivalent income of 2,000 Euro, cf. Orsini (2006). Conditioning on productivity rather than earnings is a practical example of first best taxation but conveys questions about the cost and reliability of measures of wage rates (or working time) by the administration. In Belgium the information is based on the contractual

[2] Another difference with the pre-reform situation is that income up to 400 Euro from a Mini-Job held as a secondary activity does not cumulate with the primary income for tax purposes, i.e. both activities are taxed independently. This may explain the apparent success of Mini-Jobs as 'moonlighting' activity, a feature not captured in our analysis. Modelling multiple activities is often difficult as it requires information not covered by income surveys.

hours declared by the employers to the social security institutions. [3]

We assume that these administrative issues can be solved and do not generate additional costs for the government. We introduce this reform in the German system, in replacement of previous SSC exemptions, i.e. of the "old" Mini-Job regulation. Income is now taxed according to the progressive schedule from the first Euro earned, thus avoiding the drop in net income when secondary earners reach the 325 Euro limit.

Figures 1 and 2 depict the impact of the Employment Bonus on secondary earners and low-wage single individuals respectively. The net gain increases with working time so that secondary earners at part-time are encouraged to increase hours or to stop working, depending on the shape of their preferences. In either case, the change in tax treatment would necessarily reduce the incentives for part-time work. The reform may encourage those with high fixed costs of working to take up a full-time activity, while the Mini-Job rather stimulates part-time participation. In the case of single individuals, the whole budget constraint is simply shifted upwards, except for low levels of earnings in which case, as for the the Mini-Job, the reform is neutralised by the fact that social assistance is means-tested on net incomes. The reform unambiguously encourages labour supply of low-skilled workers both at the intensive and extensive margins.

3 Data Selection and Identification of Rationing

3.1 Data Selection

Our empirical assessment is based on the 2003 wave of the German Socio-Economic-Panel (GSOEP), a sample gathering socio-demographic and financial information about 12,000 representative households for the fiscal year 2002. For the estimation we restrict our sample to households where the main adults are aged between 20 and 65, are neither self-employed, retired, disabled, on maternity leave nor in full-time education. If only one spouse falls into this group, his or her labour supply is assumed to be fixed to the observed level, while the partner can flexibly adjust his/her labour supply. In other words, labour supply of these couples is modeled according to the male or female chauvinist framework. Labour supply of single males and single females is also modeled separately. We therefore distinguish between five groups in the empirical analysis: single women (1,022 observations), single men (783), couples where both spouses have a flexible labour supply (3,822), couples where the male labour supply is fixed (970), and couples where the female labour supply is fixed (562). Table 2 contains some descriptive statistics of the relevant variables.

[3] In France, where a similar instrument was implemented (the PPE), self-reporting via individual tax forms seems to prove satisfactory. Of course there is always the risk that either employees or employers report misleading information about actual working time in order to benefit from the subsidy.

3.2 Identification of Involuntary Unemployment

Two questions are used to distinguish voluntary and involuntary unemployment. Each potential worker is asked (i) whether he/she has actively searched for a job within the last four weeks and (ii) whether he/she is ready to take up a job within the next two weeks. We follow the ILO definition and treat those unemployed who answer both questions in the affirmative as rationed. Table 2 shows that around 6% of the individuals living in couples and around 10% of the singles are involuntarily unemployed according to this definition. Note that these rates differ from official unemployment statistics since their denominators contain some of the inactive population (precisely the voluntary unemployed) and also because of selection criteria.

The probability of rationing is identified by regional demand-side variables and individual characteristics. For the former we use county information to describe the situation on the local labour market. The 181 labour office districts have been classified by Blien et al. (2004) into twelve types with similar labour market conditions that can themselves be summarised into five clusters. The classification is built upon several labour market characteristics, the most important criteria being the underemployment ratio and the corrected population density.[4] We assign each individual (based on his/her place of residence) to one of the five clusters and compute for each cluster the rate of involuntary unemployment as defined above.[5] Table 3 contains a short description of each cluster, each of which is ordered decreasingly with the level of tension on the labour market according to Blien et al.'s criteria above. Male and female unemployment rates vary consistently with the ranking of local labour markets. In particular, counties in Cluster V which have the best labour market situation, present the lowest rate of involuntary unemployment (3.1% for females and 2.4% for males), while Cluster I (consisting of nearly all of East Germany) shows the most depressed labour market (12.4% for females and 11.7% for males). Overall, we think that the clustering provides a good approximation of the differences in the local labour market situation, allowing us to adequately capture demand-side constraints in later estimates. In addition, we exploit the panel dimension of the GSOEP to integrate current information on past employment records. This information is valuable for identification of the individual risk of rationing.

[4]The underemployment ratio is defined as the relation of the number of unemployed individuals and participants in several active labour market programmes to the number of all employed persons plus these programmes' participants. The corrected population density is used to improve the comparability of rural labour office districts with metropolitan and city areas. In addition, the vacancy quota, describing the relation of all reported vacancies at the labour office to the number of employed persons, and the placement quota which contains the number of placements in relation to the number of employed persons, are used. Finally, an indicator for the tertiarisation level built on the number of employed persons in agricultural occupations and an indicator for the seasonal unemployment are considered.

[5]Since the clusters refer to labour office districts and the individuals' place of residence is on county level, we have to do some readjustments. We follow a rather simplistic approach and assign counties belonging to more than one labour office district to the one where the majority of inhabitants are located.

4 Labour Supply Models

4.1 Unconstrained Model

Discrete choice models of labour supply are based on the assumption that a household i can choose among *J+1* working hours (non-participation denoted by $j = 0$ and J positive hours denoted by $j = 1, ...J$). For each discrete choice j, its net income C_{ij} (equivalent to aggregate household consumption in a static framework) is computed by tax-benefit microsimulation techniques so that leisure-consumption preferences can be estimated. The approach has become standard practice as it provides a straightforward way to account for the nonlinear and nonconvex budget sets of complex tax and benefit systems when modeling individual and joint labour supplies of spouses. Choices *j=0,...,J* in a couple correspond simply to all combinations of the spouses' discrete hours; see van Soest (1995). Precisely, the utility V_{ij} derived by household i from making choice j is assumed to depend on a function U of spouses' leisures Lf_{ij}, Lm_{ij}, disposable income C_{ij} and household characteristics Z_i, and on a random term ϵ_{ij}:

$$V_{ij} = U(Lf_{ij}, Lm_{ij}, C_{ij}, Z_i) + \epsilon_{ij}.$$

If the error term ϵ_{ij} is assumed to be identically and independently distributed across alternatives and households according to an EV-I distribution, the probability that alternative k is chosen by household i is given by (McFadden, 1974):

$$P_{ik} = \Pr(V_{ik} \geq V_{ij}, \forall j = 0, ..., J) = \frac{\exp U(Lf_{ik}, Lf_{ik}, C_{ik}, Z_i)}{\sum_{j=0}^{J} \exp U(Lf_{ij}, Lf_{ij}, C_{ij}, Z_i)}.$$

The likelihood for a sample of observed choices can be derived from that expression and maximised to estimate the parameters of the function U. When actual working hours are used to define the individual leisure terms, the econometrician assumes that individuals freely choose their working hours and face no demand-side constraints. The approach is that of a pure - *unconstrained* - labour supply model.

In the following, we assume a quadratic specification of the utility function as in Blundell, Duncan, McCrae, and Meghir (2000). Hence, the utility function of a couple has the following form:

$$\begin{aligned} U_{ij} = {} & \alpha_c C_{ij} + \alpha_{cc} C_{ij}^2 + \alpha_{lf} Lf_{ij} + \alpha_{lm} Lm_{ij} + \alpha_{lf^2} Lf_{ij}^2 + \alpha_{lm^2} Lm_{ij}^2 \\ & + \alpha_{clf} C_{ij} Lf_{ij} + \alpha_{clm} C_{ij} Lm_{ij} + \alpha_{lmf} Lf_{ij} Lm_{ij}. \end{aligned} \tag{1}$$

We assume that preferences vary across households through taste-shifters on income and leisure coefficients:

$$\alpha_c = \alpha_{c0} + \alpha_{c1} X_1 \tag{2}$$
$$\alpha_{lf} = \alpha_{lf0} + \alpha_{lf1} X_2$$
$$\alpha_{lm} = \alpha_{lm0} + \alpha_{lm1} X_3.$$

where X_1, X_2, and X_3 are vectors including age, number and age of children, and region of residence. We follow van Soest (1995) and introduce dummy variables for the part-time categories in order to capture specific (dis)utility from working part-time. In the estimation we do not consider potential effects of unobserved heterogeneity which implies that the independence of irrelevant alternatives (IIA) property holds. However, Haan (2006) has shown that labour supply elasticities estimated on the same data as in the present study do not differ significantly when unobserved heterogeneity is introduced.

The utility function and the choice probability of a single individual are derived in the same way as above, yet only contain the leisure term of this individual. Couples where one spouse is fixed are treated in the same way. In both cases we allow for six discrete choices while for couples where both spouses are assumed to have flexible labour supplies, each of them has six choices, hence a total of 36 combinations. Discrete hours and corresponding average levels of household net income are reported in Tables 4, 5 and 6.

4.2 Constrained Model

Several studies have previously accounted for involuntary unemployment in labour supply estimations, using an interesting variety of approaches. Blundell, Ham, and Meghir (1987) extend the binomial model of female participation by introducing a probability of rationing that results in a double-hurdle model. Hogan (2004) extends the approach to a panel structure, relaxing the IIA hypothesis through nested logit modelling. Bingley and Walker (1997) combine a latent model for the probability of involuntary unemployment with a discrete-choice multinomial probit model for the labour supply of lone mothers. Duncan and MacCrae (1999) proceed in a similar way for women in couples by using a conditional logit framework. However, they assume unemployment of men to be completely voluntary. Laroque and Salanie (2002) model the labour supply of French women by introducing classical unemployment due to the censorship of the minimum wage; other involuntary unemployment is a residual category gathering all other explanations (frictional or business cycle unemployment). Finally, Euwals and van Soest (1999) suggest using information about desired versus actual working hours of single men and women in the Netherlands to disentangle preferences and demand-side rationing.

The *constrained* model we suggest is close to Duncan and MacCrae (1999) but differs in two aspects. First, we model involuntary unemployment for both men and women in couples. This is important, as the share of involuntary unemployed is particulary high for men (see table 2). Second, we use information on desired working hours (part-time or full-time) of unemployed workers; this way, preferences are estimated more precisely than if we simply model the probability of desired participation.

We combine the labour supply model previously described with a rationing risk model. For a single i, or spouse i in a couple, we specify a latent equation of involuntary unemployment:

$$I_i^* = \beta X_i + \eta_i \tag{3}$$

as a stochastic function of characteristics X_i thought to influence the probability of getting a job. Under the assumption of standard normality of the random term η_i, the risk of rationing is modelled as a standard probit. As stressed by Blundell, Ham, and Meghir (1987), this framework allows the introduction of demand-side regional variables together with individual characteristics (mainly education and past employment records).

The model we are estimating can be seen as a double-hurdle representation. The first hurdle is the decision to be voluntarily inactive or to participate in the labour market, working either part-time, full-time or overtime; the second hurdle describes the probability of being involuntarily unemployed for those who decide to participate in the first stage. Denoting d the desired hours and p a dummy representing non-rationing, we can summarise the situation of a single individual with three possible states: to be voluntarily inactive ($Pr(d = 0)$), to be rationed ($Pr(d > 0, p = 0)$) and to participate without being rationed ($Pr(d > 0, p = 1)$). In the present set-up, these probabilities are written as follows:

$$P_i^{VOL} = \Pr(d_i = 0) = \frac{\exp U(L_{i0}, C_{i0}, Z_i)}{\sum_{j=0}^{J} \exp U(Li_j, C_{ij}, Z_i)} \tag{4}$$

$$P_i^{INVOL} = \Pr(d_i > 0, p_i = 0) = \sum_{k=1}^{J} \left(\frac{\exp U(L_{ik}, C_{ik}, Z_i)}{\sum_{j=0}^{J} \exp U(L_{ij}, C_{ij}, Z_i)} [\Phi(\beta X_i)] \right) \tag{5}$$

$$P_i^{EMP} = \Pr(d_i > 0, p_i = 1) = \sum_{k=1}^{J} \left(\frac{\exp U(L_{ik}, C_{ik}, Z_i)}{\sum_{j=0}^{J} \exp U(L_{ij}, C_{ij}, Z_i)} [1 - \Phi(\beta X_i)] \right). \tag{6}$$

Individual contributions to the likelihood for those who wish to participate, i.e. for whom $Pr(d > 0)$, are slightly different from (6) and (7): they correspond to the probability of a given positive hour conditional to the rationing risk. Optimal labour supply is either recovered from observed hours (for employees) or from declared desired hours (for the involuntarily unemployed).[6]

For couples, we estimate one rationing probability per spouse. As in Duncan and MacCrae (1999), we assume that the error terms of the labour supply model and the probit of rationing are independent which allows us to estimate the unemployment risk separately. We do so by pooling single and married individuals and by estimating men and women separately.

[6] We can reasonably assume that desired hours of employed individuals coincide with actual observed hours. This is indeed the case for over 85% of the working population while means are respectively 21.9 and 21.2 hours per week (when including non-participants). For the involuntarily unemployed, we make use of the information in the data about which type of contract they are looking for, whether part-time (21-34 hours) or full-time (35-40 hours)

5 Estimation Results

5.1 Unemployment Risk Estimates

We start with the estimation of the probability of rationing, results are presented in Table 7. In the estimation we account for the problem of matching micro data with aggregate (regional) information as in Moulton (1990). We allow for correlation within a region and therefore derive consistent standard errors for the regional variables. The coefficients of the regional indicators, introduced in reference to the first cluster, where risks of rationing are highest, are all highly significant. They are ranked according to expectation, except for the third cluster in the case of women. The education variables show that higher degrees provide higher protection against unemployment. The risk of involuntary unemployment is affected by previous working history. Dummies representing employment in October of the previous three years show significant state dependency with respect to the last two years.

5.2 Labour Supply Estimates

We now turn to the estimates of the *constrained* and *unconstrained* labour supply models. Results are presented in Table 8 for single individuals and in Tables 9 and 10 for couples. In both the unconstrained and the constrained model, and for all household groups (single women, single men, flexible couples, couples with fixed husbands and couples with fixed wife), almost all households fulfill monotonicity and concavity of the utility function with respect to the various choice variables. Most importantly, utility increases with net income for almost all households, as shown in the bottom parts of Tables 8, 9 and 10; this is the minimum requirement for the consistency of tax reform simulations hereafter. The derivatives with respect to leisure show that for a small share of the population positive monotonicity in leisure is not respected. As stressed by Euwals and van Soest (1999), there is no necessity to restrict preferences relative to the taste for leisure.

The marginal utility of income and leisure depends on individual- and household-specific variables. As expected, the presence of young children significantly increases preference for leisure of women in all groups. In line with previous studies, East German women prefer to work more. Taste shifters related to age are not always significant and do not display clear patterns. Finally, parameters of the part-time dummies are negative and significant, suggesting some 'disutility' stemming from this work arrangement. Coefficients are less negative for women since they are employed part-time more frequently than men (similar results are found by Bonin, Kempe, and Schneider, 2003). In the estimated system of indifference curves, inclusion of these dummies yields a hump in the part-time range of working hours and suggests that, other things being equal, larger participation effects are to be expected from the Bonus due to its targeting on full-time activity.

5.3 Predicted Elasticities

In the present non-linear model, labour supply elasticities cannot be derived analytically but it is possible to simulate the impact of a marginal increase in gross hourly wages on hours of work and participation numerically. Instead of the 'aggregated frequencies' technique, that is aggregating the expected individual hour supply over the whole sample, we follow the calibration method which is consistent with the probabilistic nature of the model at the individual level (Creedy and Duncan, 2002). It consists in drawing for each household a set (here, 100 draws) of $J + 1$ random terms from the *EV-I* distribution that generates a perfect match between predicted and observed choices. The same draws are kept when predicting labour supply responses to a shock on wages or a tax reform. Averaging individual supply responses over a large number of draws provides robust transition matrices. Confidence intervals for elasticities (or labour supply responses to a reform) are obtained by repetitive random draws of the preference parameters from their estimated distributions and, for each draw, by applying the calibration procedure.

Table 11 presents estimated elasticities obtained with the constrained and unconstrained models. In both cases they are computed using the whole selected population of potential workers (either constrained or unconstrained, working or not working). While the next sub-sections look at employment effects of the Mini-job reform and the Employment Bonus, we here focus on *pure* labour supply elasticities to characterise potential working behaviour. In other words, we look at changes in *desired* hours; the baseline of the *constrained* model corresponds to actual desired hours as recorded in the data while the baseline of the *unconstrained* model corresponds to observed hours, i.e. constrained workers are (mistakenly) assumed to voluntarily choose inactivity.

The elasticities from the *unconstrained* model are in line with the labour supply literature (Blundell and MaCurdy, 1999) and similar in magnitude to those found in recent studies on Germany, such as Haan and Steiner (2005) or Steiner and Wrohlich (2005). For all groups the elasticities are relatively modest. They lie in a narrow range between 0.2 and 0.3 except for women in couples (above 0.3) and men in couples where the women have fixed labour supplies (below 0.2). In this last group, a relatively high share of women are on maternity leave while the labour supply of men with small children is known to be rather inelastic. Estimates from the *constrained* model are more precise, while females in couples still display the largest elasticities.

Not considering involuntary unemployment in the *unconstrained* model leads to biased estimated elasticities for several reasons. We suggest a breakdown of these effects. First, the unconstrained model unduly allows transitions to participation for those constrained workers, assumed to voluntarily choose inactivity in the first place, whose predicted hours are positive after a wage shock. In contrast in the *constrained* model, these workers have positive desired hours in the baseline and contribute to changes at the intensive margin. This 'participation bias' leads to a clear upward bias of the labour supply elasticities from the *unconstrained* model. A second source of discrepancies is the 'preference bias' stressed by Ham (1982) which acts in the opposite direction. In effect, ignoring involuntary unemployment necessarily leads to overstating the taste for leisure in the estimates and, therefore, to understating elasticities. Finally, a 'specification bias' must affect estimates in a way which is *a priori* uncertain. The *unconstrained* model is indeed misspecified since individual characteristics are not only required to explain consumption-leisure preferences but also implicitly account for demand-side constraints. As a result, labour supply estimates reported in Tables 8, 9, and 10 are more precisely estimated with the *constrained* model. Moving from unconstrained to constrained estimates, the significance of some taste-shifters change in a characteristic way. In particular, the dummy for East Germany is no more significant in affecting male preference for leisure: lower employment rates of males appear to be associated with a stronger rationing effect in East Germany and not with a difference in the taste for leisure, as the unconstrained model would suggest. On the other hand, the dummy for East Germany is significant for females in both models, suggesting lower preferences for non-market time there.

The sign of the overall bias is not clear a priori. From results in Table 11, it turns out that the upward bias dominates. Average unconstrained elasticities of working hours are indeed larger for most groups. Differences are important in groups with a high share of the involuntarily unemployed, typically single men, while they are not significant for married women who frequently choose non-participation on a voluntary basis due to family constraints.[7] Comparing hours and participation suggests that overstatement in the former is driven by the 'participation bias'.

In order to provide a better understanding of the differences, we distinguish the labour supply effects of three groups (voluntarily inactive, involuntarily unemployed, employed) as shown in Table 12. Instead of elasticities, we present the absolute changes in participation rates and total hours of work for each group, given a 1% uniform increase in gross wages. Results emphasise the role of the 'participation bias': with the *unconstrained* model, involuntarily unemployed workers markedly increase hours due to a large participation effect; this effect vanishes in the *constrained* model. The differences for the employed and the voluntarily inactive are in general very small and go in both directions. The overstatement of the taste for leisure, or 'preference bias', dominates for women in couples (the effect on labour supply is larger with the constrained model). Results are less clear-cut for the other groups, due to the interplay of 'preference' and 'specification' bias.

6 Employment Effects of the Reforms

The concept of *pure* labour supply elasticities derived from the constrained model is insightful to explain working behaviour and to measure potential responsiveness to changes in financial incentives. Yet, this concept is based on desired hours and cannot provide information about the true employment effects of a reform which is the relevant information for policymakers. In the following, we account for the rationing risk and predict employment effects of the two reforms for the main labour force (about 30 million individuals).

Since our modeling of the rationing probability is a reduced form equation, we cannot assess the impact of the reform on demand-side variables, for instance through wage rate adjustments or

[7] Previous findings confirm that elasticities of hours for single workers are around twice as small when accounting for demand constraints (Euwals and van Soest, 1999).

changes in vacancy rates simultaneous to labour supply responses. Our analysis is partial in this respect, since we must assume that the individual rationing probability is not affected: constrained workers remain in their situation after the reform and do not affect the total working hours.[8] In other words, potential employment effects are concentrated only on those voluntarily inactive and those already working.[9]

For both unconstrained and constrained models, Tables 13 and 14 display total participation effects (in number of workers) and total hours effects (in Full Time Equivalent, FTE hereafter). The latter is broken down between hours effects of those individuals that enter the labour market (extensive margin) and that of those who had been in employment before the reform (intensive margin). We report the median, upper and lower values of the 90% confidence interval from bootstrap simulations. Tables also indicate the proportion of new rationing. With the Mini-Job reform, for instance, almost 16% of the voluntarily inactive that are induced to enter the labour market will be rationed from the demand side. This percentage is significantly higher than the current unemployment rate of any of the groups. This is hardly surprising, given that the labour market characteristics of the inactive population are often weaker than those of the active population.

6.1 The Mini-Job Reform

On the extensive margin, the Mini-Job reform induces a net positive effect on participation of 56,000 (resp. 43,000) individuals according to the *constrained* (*unconstrained*) model which is in line with the government's goal of 'making work pay'. Both models agree that the labour supply effect is mainly borne by women living in couple households while the participation effects for singles and in particular for men are negligible. This result is in line with initial intuitions: the net gain of the reform concerns primarily secondary earners in couples; the budget sets of singles are hardly affected due to the fact that gains at part-time are neutralised by the social assistance scheme. Women in couples are induced to take part-time jobs so that variations at the extensive margin are smaller once translated in FTE. For instance, with the *constrained* model, the participation effect in this group represents 36,000 additional workers which corresponds to an increase in total hours equivalent of 11,000 FTE.

The positive participation effect is counteracted by a negative effect on the intensive margin for people already at work, especially for part-timers. This is a well-known problem of policies targeted at low-income people (Blundell, Duncan, McCrae, and Meghir, 2000). According to the *unconstrained* model, women in couples have the highest negative effect on this margin: labour

[8] The Mini-Job reform has, indeed, only a small direct effect on labour cost while the Employment Bonus has no effect whatsoever on labour demand. In the case of the Mini-Job, however, firms may adjust labour demand in different ways to respond to changes in legislation (e.g., by splitting previous full-time jobs into several Mini-Jobs). Other possible feedback effects may lead to changes in the equilibrium gross wages (here assumed to be constant). These effects are very difficult to account for without a more comprehensive framework (e.g., CGE models).

[9] A distinction must be made. The population already employed may freely choose to change working hours or to withdraw from the labour market (they are not rationed). The voluntarily inactive may decide to enter the labour market following the reform, but their expected labour supply is weighted by their individual rationing risk which is deterministically predicted ex-ante.

supply decreases by 17,000 FTE. Over the whole population, the model suggests a reduction of about 33,000 FTE , while the increased participation is about 28,000 FTE, yielding a net reduction of labour supply by around 4,000 FTE. When ignoring the involuntarily unemployed, our findings are very similar to those of Arntz, Feil, and Spermann (2003) and Steiner and Wrohlich (2005).[10]

The picture is only slightly different when the estimates are based on the *constrained* model. Not surprisingly, differences mainly come from (smaller) participation effects while effects at the intensive margin are very similar. The total net effect on hours is a reduction of 11,000 FTE to be compared to the reduction of 4,000 FTE predicted by the unconstrained model. The difference is not statistically significant. Note that these figures hide several sources of discrepancy. First, rationed workers can contribute to the participation effect only in the unconstrained case. Second, the voluntarily unemployed who are induced to take up a job after a reform face a rationing risk with the constrained model. Third, elasticities are overstated by the unconstrained estimation. The first two effects cumulate to explain differences at the extensive margin. Interestingly, since the Mini-Job reform mainly targets secondary earners, i.e. the group with the highest proportion of voluntarily unemployed persons, these effects are limited.

6.2 The Employment Bonus

The Employment Bonus has a very strong participation effect: almost 160,000 additional individuals are estimated to enter the labour market according to the *unconstrained* model. Half of the new entrants are women in couples. Part of the success is due to the fact that the Bonus targets full-time activity and avoids the specific (dis)utility from working part-time revealed by labour supply estimates. In addition, targeting earnings at full-time allows to escape partly from the neutralising effect of social assistance for single individuals which explain a substantial participation effect on this group while the Mini-Job reform was totally ineffective. Note also that jobs created by the Employment Bonus (resp. Mini-Job reform) are most often full-time (resp. part-time) activities so differences in participation effects of the two reforms are even larger when considering FTE measures.

For those in employment, the 'part-time trap' is avoided by conditioning eligibility on wage rates rather than earnings. Therefore we do not ex-ante expect negative labour supply effects at the intensive margin. A minor reduction may nevertheless be encountered amongst people working over-time since the benefit reaches a maximum at standard full time (i.e. 40 hours/week) and then decreases. The model indeed forecasts a small reduction among men in couples, the group with the largest proportion of over-time workers. In all other groups, however, hours of work increase,

[10] Note also that our estimates seem considerably lower than the 523,000 new Mini-Jobs created between March 2003 and March 2004 according to the Federal Employment Agency (Bundesagentur für Arbeit, 2004). However, we here focus on additionally created employment, while the estimates of the FEA include persons who were already employed before the reform (241,000 with an income between 326 and 400 Euro and 196,000 with an income higher than 400 Euro) and who are now categorised as 'Mini-Jobbers'. Official job creations then decrease down to around 86,000. Furthermore, it should be kept in mind that we concentrate on the main labour force, excluding students and pensioners from our analysis. Assuming that these groups account for about a third of the total effect, the FEA number is further reduced down to around 50,000, i.e. a number well within the estimated confidence intervals of both models.

leading to an overall gain of 211,000 FTE.

Although the general direction of the labour supply effects is the same under both models, the size of these effects is substantially overstated by the *unconstrained* model. This result is essentially due to discrepancies in predicted participation effects, even more so in groups where the proportion of involuntary unemployment is large, i.e. men in couples and single individuals. In these groups, participation effects are two or three times larger with the unconstrained model. For married or cohabiting women, the overstatement is smaller in relative terms ('only' 50%) – this is the group with the largest voluntary unemployment – but the largest in absolute terms since this group displays large effects.

Finally, it is important to stress that the superiority of the Employment Bonus reform is not driven by larger budgetary costs (3.09 billions Euro per year versus 1.89 for the Mini-Job reform). In effect, when behavioural responses are accounted for, the net costs of the two reforms become comparable. Very clearly, the tax base of the Employment Bonus increases so that its net cost decreases substantially. A comparison of the cost efficiency of both reforms is enlightening; for this purpose, we simply divide total cost after labour supply responses by the number of new entrants after the reform (when using constrained estimations). The Mini-Job performs substantially worse with a unitary cost of 44,000 Euro versus 19,000 for the Employment Bonus. Naturally, efficiency concerns may need to be balanced against other social objectives.

7 Conclusions

In this paper, we quantify discrepancies from ignoring involuntary unemployment when evaluating the employment effects of 'Making Work Pay' reforms in Germany. To do so we apply a double-hurdle model that accounts for unemployment risk when estimating a structural labour supply model.

Our first set of results consists of an original characterisation of the bias affecting labour supply elasticities when rationing is ignored. While misspecified ('specification bias'), an unconstrained model would overstate participation effects but also taste for leisure ('preference bias'). Yet, it seems that the 'participation bias' dominates so that elasticities from this unconstrained model are overstated. The overall bias is particularly apparent for groups with a high share of involuntarily unemployed amongst the non-working, such as single individuals or men in couples.

Our second contribution consists of questioning the optimality of alternative in-work policies in a given institutional setting in Germany. We focus on the recently implemented Mini-Job reform and an hypothetical scheme inspired by the Belgian Employment Bonus. The Mini-Job reform extends the threshold of previous exemptions of employees' social security contributions and phase them out. However, the reform has kept a critical feature of the previous system: Mini-Jobs are fully exempted from income tax but the exemption is not phased out beyond the threshold. The system thus creates a 'part-time trap'. Indeed secondary earners are encouraged to bunch at the threshold level, since, as soon as they cross the threshold, they face their partners' marginal tax rate (on all their earnings). The reform does not only induce participation at part-time but also reinforces the incentives to reduce working hours (an effect which outweighs the positive participation effect). The Employment Bonus, in contrast, targets full time activity and generates larger participation effects. Conditional on wage rates, it avoids negative effects at the intensive margin. Overall, a move toward in-work policies conditional on wage rates rather than earnings seems recommendable both in terms of employment effects and cost efficiency. Naturally, conditioning on wage rates requires reliable information on working time and may imply additional administration costs.

Finally, comparing the predictions of employment effects by the standard labour supply model and by the double-hurdle model yields interesting information. Ignoring demand-side constraints essentially leads to an overstatement of effects at the extensive margin. The reasons are twofold: rationed workers are unduly included in the group of those who can react to the reform; the voluntarily unemployed who are induced to take a job after a reform are mistakenly not subject to the rationing risk. As illustrated by the Mini-Job reform, the overall bias is not critical when responses are small and driven by groups who are less affected by rationing, typically voluntarily inactive women in couples. However, when responses are substantial and when other groups are concerned (men in couple households, single individuals), the overall prediction error of employment effects becomes large. In the case of the Employment Bonus, the total employment effect is overstated by about 60%. Our findings call for caution when evaluating policies targeting groups facing significant unemployment. Accounting for demand side constraints and individual rationing is therefore necessary to produce reliable estimations of aggregated labour supply effects.

Table 1: Pre- and post-reform legislation of the German tax and benefit system

	Baseline	Mini-Job Reform[1]	Employment Bonus
Mini-Job Definition:			
Maximum hours restriction	15 h per week	-	-
Income restriction	325 Euros	400 Euros	-
Taxes:			
Income tax sets in at	326 Euros	401 Euros	1 Euro
Social security contributions (SSC):			
Full SSC set in at	326 Euros	801 Euros	1 Euro
Full time equivalent SSC rebate	0	0	140 Euros
Rebate is phased out after	-	-	1210 Euros
Taper rate	-	-	17.80%

[1] Following the 2003 Mini-Job reform, additional earnings from a Mini-Job do not cumulate with earnings from other sources. This aspect is not taken up in our simulation.

Table 2: Some descriptive statistics for the estimation sample[(a)]

	Singles		Couples					
			Both flexible		Male flexible		Female flexible	
	Fem.	Mal.	Fem.	Mal.	Fem.	Mal.	Fem.	Mal.
Individual Information								
Age	41.87	41.77	42.15	44.71	40.89	43.65	47.33	50.64
Working hours per week	34.86	39.72	28.05	41.25	29.99	40.93	28.71	46.33
No degree	0.15	0.11	0.17	0.10	0.13	0.08	0.15	0.09
Education = 0: No degree	0.02	0.02	0.02	0.03	0.01	0.01	0.02	0.02
Education = 1: Low degree[1]	0.71	0.69	0.74	0.70	0.61	0.60	0.75	0.67
Education = 2: High degree[2]	0.27	0.28	0.23	0.28	0.36	0.39	0.23	0.30
Hourly wage (cond. on working)	14.55	17.16	13.92	19.31	13.85	20.46	13.93	16.77
Hourly wage (cond. on not working)[3]	9.63	11.09	9.92	13.19	10.40	12.74	10.05	11.59
Children from 0-3 years	0.04	0.00	0.13		0.23		0.08	
Children from 3-6 years	0.07	0.00	0.14		0.12		0.11	
Children over 6 years	0.45	0.07	0.86		0.74		0.64	
German	0.95	0.94	0.90		0.93		0.94	
East Germany	0.16	0.21	0.17		0.21		0.17	
Employment Status[4]								
Involuntarily Unemployed[5]	0.11	0.10	0.06	0.06	-	0.06	0.06	-
Voluntarily Unemployed[5]	0.12	0.09	0.26	0.06	-	0.07	0.30	-
Employed	0.78	0.81	0.69	0.88	-	0.87	0.64	-
No. of observations	1022	783	3822	3822	562	562	970	970

Note: We distinguish between singles, couples where both spouses have a flexible labour supply, and couples where either the man or the woman has a flexible labour supply while the labour supply of the other partner is fixed.

[1] Secondary general school ('Hauptschule'), intermediate school ('Realschule') or other degree.

[2] Upper secondary school ('Gymnasium')

[3] Imputation through a standard Heckman 2-step equation.

[4] The employment status of males (females) in couples where only one spouse has a flexible labour supply is retired, self-employed, on maternity or parental leave, or disabled.

[5] To distinguish between voluntary and involuntary unemployment, we make use of the search activity within the last four weeks and the readiness to take up a job within the next two weeks.

Table 3: Involuntary unemployment and description of the strategic types of labour office districts

Cluster	Description	No. of districts	Involuntary Unemployment (in %) Females	Males
I	East German labour office districts (excluding Dresden)	38	0.124	0.117
II	Labour office districts dominated by large cities	22	0.065	0.070
III	West German labour office districts with rural elements, medium-sized industry, and average unemployment	63	0.047	0.054
IV	West German centers with good labour market prospects	10	0.049	0.049
V	West German labour office districts with the best labour market prospects	48	0.031	0.024

Source: Blien *et al.* (2004)

Table 4: Working hours and net household income for singles

Hours Classification	Hours per week (average)		Share (in %)		Net Income (average)	
	Men	Women	Men	Women	Men	Women
0	0	0	16.71	20.89	735.02	844.37
1	6.9	7.5	1.13	3.95	1016.49	1103.04
2	17.3	18.2	1.38	6.45	1088.29	1199.70
3	27.7	28.2	3.27	14.63	1421.32	1468.71
4	38.5	38.8	50.25	39.75	1773.62	1753.14
5	49	46.4	27.26	14.34	2115.14	1958.05

Note: The following hours classifications are used: 0, [0,12],]12,20],]20,34],]34,40], >40.

Table 5: Working hours and net household income for couples where only one spouse is flexible

Hours	Males flexible			Females flexible		
Classification	Hours per week (average)	Share (in %)	Net Income (average)	Hours per week (average)	Share in % (in %)	Net Income (average)
0	0	13.74	1943.68	0	34.22	2905.91
1	6.9	1.57	2289.79	8.5	7.94	3198.88
2	17.7	1.39	2591.20	18	12.63	3439.52
3	28.2	2.09	3034.72	27.5	15.07	3700.04
4	38.5	41.04	3446.78	38.5	21.28	3976.86
5	47.7	40.17	3847.14	47.7	8.86	4208.99

Note: The following hours classifications are used: 0, [0,12],]12,20],]20,34],]34,40], >40.

Table 6: Working hours and net household income for couples where both spouses have a flexible labour supply

Hours Class.	Hours per week (average) Men	Women	Share (in %)	Net Income (average)	Hours Class.	Hours per week (average) Men	Women	Share (in %)	Net Income (average)
1	0	0	4.63	1282.91	19	28.2	0	0.64	2202.31
2	0	8.5	0.69	1568.82	20	29.3	7.2	0.15	2493.10
3	0	17.6	0.95	1699.02	21	27.7	17.4	0.36	2614.93
4	0	27.7	1.10	1927.59	22	29	26.5	0.49	2909.05
5	0	38.4	2.71	2160.00	23	28.6	38.8	0.56	3212.00
6	0	48.5	0.79	2398.13	24	26.2	50.6	0.18	3426.15
7	6.4	0	0.20	1595.45	25	38.6	0	13.62	2594.63
8	6.4	6.8	0.08	1843.40	26	38.4	8.4	5.20	2859.30
9	5.7	17.5	0.03	1972.82	27	38.5	18	7.17	3064.02
10	8	26.7	0.15	2252.12	28	38.7	27	9.06	3303.84
11	7.7	37.7	0.15	2472.35	29	38.5	38.3	12.77	3567.52
12	7.1	50.6	0.13	2754.81	30	39	45.6	2.94	3768.26
13	16.5	0	0.23	1753.40	31	49.5	0	9.60	3036.37
14	15.7	6.8	0.05	1956.40	32	49.5	7.8	3.51	3299.39
15	17.2	17	0.08	2186.29	33	50	18	4.74	3537.61
16	17.3	27.9	0.08	2487.95	34	50	27.2	6.25	3764.40
17	16.7	38.8	0.28	2756.73	35	48.6	38.5	7.01	3970.93
18	18.1	46.6	0.03	3018.19	36	51	48.8	3.40	4311.98

Note: The following hours classifications are used: 0, [0,12],]12,20],]20,34],]34,40], >40.

Table 7: Estimation results for the unemployment probabilities

	Women[1] Coef.	s.e.	Men[1] Coef.	s.e.
Constant	*-1.176*	0.487	**-0.963**	0.304
Regional Information				
Cluster 1	Reference		Reference	
Cluster 2	**-0.352**	0.016	**-0.451**	0.019
Cluster 3	**-0.477**	0.021	**-0.598**	0.013
Cluster 4	**-0.379**	0.018	**-0.631**	0.014
Cluster 5	**-0.578**	0.036	**-0.831**	0.015
Age	*5.374*	2.731	**5.651**	1.260
Age-Squared	*-6.521*	3.177	**-6.490**	1.290
Educational Degree				
No degree	Reference		Reference	
Medium degree	**-0.519**	0.130	**-0.557**	0.106
High degree	**-0.934**	0.154	**-1.128**	0.152
No vocational degree	**0.358**	0.128	**0.368**	0.056
Employment Status in[2]				
October 1998	-0.099	0.065	-0.029	0.089
October 1999	<u>-0.213</u>	0.115	<u>-0.364</u>	0.204
October 2000	**-0.604**	0.124	**-0.510**	0.100
Observations		4451		4859
Pseudolikelihood		-972.04		-1044.53

Note: **Bold** letters indicate significance at the 1%-level, *italic* letters refer to the 5%-level, and <u>underlined</u> letters to the 10%-level. Standard errors were estimated according to Moulton (1990).

[1] The unemployment probability has been estimated for all women (single + married) and men (single + married).

[2] Dummies equal 1 if regular full-time employment at indicated dates, 0 otherwise.

Table 8: Estimation results for singles: rationed and unrationed models

	Unrationed Model				Rationed Model			
	Women		Men		Women		Men	
	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.
Consumption								
Age	4.181	13.528	-10.070	11.055	23.219	14.484	-18.627	12.777
Age-Squared	-7.505	14.519	12.230	12.029	-25.685	15.581	21.108	13.594
Constant	4.130	3.076	*4.843*	2.544	-1.802	3.294	*6.866*	2.995
Leisure								
Age	-0.022	0.288	-0.277	0.285	0.194	0.330	-0.599	0.353
Age-Squared	0.208	0.323	0.487	0.324	0.094	0.366	*0.893*	0.392
Child 0-3	**0.128**	0.018			**0.128**	0.015		
Child 3-6	**0.068**	0.009			**0.075**	0.009		
German	*0.020*	0.009	-0.014	0.009	0.020	0.010	-0.009	0.011
East Germany	0.001	0.005	**0.015**	0.005	-0.012	0.007	-0.003	0.007
Constant	**0.478**	0.074	**0.411**	0.072	**0.455**	0.082	**0.569**	0.086
Consumption^2	**-0.471**	0.113	**-0.119**	0.026	**-0.365**	0.120	**-0.118**	0.027
Leisure^2	**-0.004**	0.000	**-0.003**	0.000	**-0.005**	0.000	**-0.004**	0.000
Consumption×Leisure	**-0.021**	0.008	**-0.028**	0.006	-0.014	0.009	**-0.033**	0.007
Part-time category 1	**-2.734**	0.184	**-3.855**	0.416	**-2.492**	0.187	**-3.369**	0.422
Part-time category 2	**-2.585**	0.176	**-3.875**	0.347	**-2.699**	0.174	**-3.851**	0.348
Part-time category 3	**-1.744**	0.138	**-2.966**	0.214	**-1.866**	0.132	**-3.143**	0.213
Observations		1022		783		1022		783
Wald chi2		2.85		1.58		2.79		2.78
Log-Likelihhod		-1448.25		-873.81		-1394.53		-778.49
Derivatives (in percent)								
$U_c > 0$		99%		100%		99%		100%
$U_{lf} > 0$		74%				79%		
$U_{lm} > 0$				79%				89%

Note: **Bold** letters indicate significance at the 1%-level, *italic* letters refer to the 5%-level, and underlined letters to the 10%-level.

Table 9: Estimation results for couples where only one spouse is flexible: rationed and unrationed models

	Unrationed Model				Rationed Model			
	Women		Men		Women		Men	
	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.
Consumption								
Age	8.507	13.735	17.691	12.495	7.270	14.277	8.851	16.286
Age-Squared	-10.932	14.997	-16.938	13.496	-9.417	15.564	-7.771	17.262
Constant	0.325	2.986	-3.097	2.692	0.445	3.106	-1.016	3.620
Leisure								
Age	-0.271	0.373	-0.035	0.391	-0.428	0.390	-0.133	0.528
Age-Squared	0.537	0.419	0.204	0.438	<u>0.745</u>	0.436	0.373	0.580
Children 0-3	**0.061**	0.010			**0.070**	0.010		
Children 3-6	**0.040**	0.008			**0.039**	0.008		
German	-0.010	0.009	-0.009	0.010	-0.010	0.009	-0.006	0.013
East Germany	**-0.031**	0.005	<u>0.012</u>	0.006	**-0.047**	0.006	-0.001	0.008
Constant	**0.324**	0.088	0.122	0.086	**0.407**	0.091	*0.251*	0.118
Consumption^2	**-0.058**	0.022	*-0.039*	0.018	*-0.056*	0.023	<u>-0.040</u>	0.022
Leisure^2	**-0.002**	0.000	**-0.001**	0.000	*-0.003*	0.000	**-0.002**	0.000
Consumption×Leisure	*-0.002*	0.001	*-0.007*	0.003	<u>-0.002</u>	0.001	**-0.013**	0.004
Part-Time category 1	**-1.857**	0.151	**-3.201**	0.458	**-1.896**	0.150	**-2.777**	0.466
Part-Time category 2	**-1.408**	0.167	**-3.357**	0.426	**-1.557**	0.163	**-3.367**	0.426
Part-Time category 3	**-1.020**	0.156	**-2.888**	0.310	**-1.132**	0.150	**-3.086**	0.308
Observations		970		562		970		562
Wald Chi^2		1.3		3.97		0.97		1.07
Log-Likelihood		-1479.65		-634.92		-1472.32		-576.81
Derivatives								
$U_c > 0$		99%		88%		99%		95%
$U_{lf} > 0$		70%				64%		
$U_{lm} > 0$				80%				82%

Note: **Bold** letters indicate significance at the 1%-level, *italic* letters refer to the 5%-level, and <u>underlined</u> letters to the 10%-level.

Table 10: Estimation results for couples where both spouses are flexible: rationed and unrationed models

	Unrationed Model		Rationed Model	
	Coef.	Std.	Coef.	Std.
Consumption				
Age - Man	-5.887	4.921	-7.588	5.389
Age-Squared - Man	4.513	5.245	6.514	5.726
Age- Woman	**12.136**	4.242	*11.728*	5.055
Age-Squared - Woman	**-13.203**	4.675	*-12.973*	5.514
Constant	<u>1.883</u>	1.088	<u>2.178</u>	1.249
Consumption-Squared	**-0.097**	0.013	**-0.089**	0.014
Leisure Man				
Age - Man	-0.191	0.154	**-0.590**	0.184
Age-Squared - Man	<u>0.321</u>	0.169	**0.832**	0.201
Constant	**0.334**	0.037	**0.441**	0.044
Leisure Man-Squared	**-0.002**	0.000	**-0.003**	0.000
Leisure Woman				
Age- Woman	0.266	0.136	0.231	0.153
Age-Squared - Woman	-0.169	0.154	-0.111	0.172
Child 0-3	**0.076**	0.005	**0.082**	0.005
Child 3-6	**0.042**	0.004	**0.041**	0.004
German	<u>-0.008</u>	0.004	*-0.008*	0.004
East Germany	**-0.035**	0.003	**-0.047**	0.003
Constant	**0.296**	0.036	**0.348**	0.040
Leisure Woman-Squared	**-0.003**	0.000	**-0.003**	0.000
Consumption*Leisure Man	**-0.014**	0.002	**-0.012**	0.002
Consumption*Leisure Woman	**-0.003**	0.001	-0.001	0.001
Leisure Man*Leisure Woman	0.000	0.000	0.000	0.000
Part-time category 1 - Women	**-1.659**	0.073	**-1.677**	0.074
Part-time category 2 - Women	**-1.430**	0.087	**-1.578**	0.086
Part-time category 3 - Women	**-0.995**	0.080	**-1.086**	0.078
Part-time category 1 - Men	**-3.418**	0.190	**-3.000**	0.193
Part-time category 2 - Men	**-3.911**	0.197	**-3.753**	0.198
Part-time category 3 - Men	**-3.049**	0.112	**-3.091**	0.112
Observations		3822		3822
Wald Chi^2		16.42		12.18
Log-Likelihood		-9991.60		-9583.59
Derivatives				
$U_c > 0$		100%		100%
$U_{lf} > 0$		71%		69%
$U_{lm} > 0$		88%		92%

Note: **Bold** letters indicate significance at the 1%-level, *italic* letters refer to the 5%-level, and <u>underlined</u> letters to the 10%-level.

Table 11: Labour supply elasticities in the constrained and unconstrained models

	Couples (both flexible)		Couples (only one spouse flexible)		Singles	
	women	men	women	men	women	men
	Change in the participation rate (in percentage points)					
Unconstrained	0.150	0.158	0.224	0.079	0.197	0.226
	(0.108-0.185)	(0.122-0.190)	(0.164 - 0.319)	(0.028 - 0.140)	(0.154 - 0.256)	(0.160-0.275)
Constrained	0.122	0.067	0.151	0.050	0.069	0.083
	(0.083-0.158)	(0.052-0.078)	(0.104-0.205)	(0.022 - 0.080)	(0.036 - 0.104)	(0.048 - 0.119)
	Change in total hours worked (in percent)					
Unconstrained	0.351	0.207	0.376	0.115	0.267	0.300
	(0.303-0.425)	(0.177-0.248)	(0.263 - 0.504)	(0 .046 - 0.179)	(0.210 - 0.344)	(0.231 - 0.368)
Constrained	0.316	0.117	0.268	0.0914	0.104	0.152
	(0.277-.362)	(0.102-0.133)	(0.189-0.339)	(0.044 - 0.132)	(0.058 - 0.159)	(0.107-0.197)

Note: Elasticities are computed by averaging over the whole sample the 100 simulated transitions, for each of the 100 draws of the utility parameters from the estimated asymptotic distribution of their estimator. The table reports the median values of each distribution and, in brackets, the 90% confidence interval.

Table 12: Labour supply effects by employment status

Employment Status and Group		Women Share of obs.	Women Unconstr. Model	Women Constr. Model	Men Share of obs.	Men Unconstr. Model	Men Constr. Model
					Couples (both flexible)		
Voluntary UE	Part.	0.25	3.60	4.50	0.05	2.73	2.61
	Work. Hours	0.25	113.84	142.30	0.05	116.76	110.84
Involuntary UE	Part.	0.05	1.11	0.00	0.06	3.08	0.00
	Work. Hours	0.05	37.70	1.25	0.06	134.49	3.38
Employed	Work. Hours	0.71	105.06	113.71	0.89	97.55	96.38
					Couples (only one spouse flexible)		
Voluntary UE	Part.	0.31	0.89	1.02	0.07	0.32	0.27
	Work. Hours	0.31	27.18	31.20	0.07	13.60	11.66
Involuntary UE	Part.	0.04	0.22	0.00	0.07	0.19	0.00
	Work. Hours	0.04	7.78	0.20	0.07	8.01	0.18
Employed	Work. Hours	0.66	17.90	14.46	0.86	6.02	5.30
					Singles		
Voluntary UE	Part.	0.13	0.82	0.80	0.08	0.40	0.51
	Work. Hours	0.13	29.95	28.34	0.08	0.83	21.42
Involuntary UE	Part.	0.08	0.80	0.00	0.09	0.06	0.00
	Work. Hours	0.08	30.55	0.47	0.09	19.30	0.95
Employed	Work. Hours	0.79	17.76	11.94	0.83	21.42	17.66

Note: Numbers are absolute changes in the participation rate and number of working hours due to a 1% increase in gross hourly wage.

Table 13: Labour supply effects of the Mini-job reform (Figures in 1000s)

	Unconstrained Model				Constrained Model				
	New Participation	Working Hours in FTE[1]			New Participation	Working Hours in FTE[1]			Share of newly
	Total	Total	Ext. margin	Int. margin	Total	Total	Ext. Margin	Int. Margin	rationed
				Couples (both flexible)					
Women	41	-3	13	-17	36	-6	11	-17	16.1%
	(35 - 47)	(-5 - -1)	(11 - 15)	(-19 - -14)	(31 - 41)	(-7 - -3)	(10 - 13)	(-19 - -14)	
Men	3	0	9	-9	0	-3	4	-7	15.7%
	(0 - 5)	(-4 - 2)	(7 - 10)	(-11 - -6)	(-1 - 2)	(-6 - -1)	(3 - 5)	(-10 - -5)	
				Couples (only one spouse flexible)					
Women	8	2	4	-2	5	0	2	-2	12.8%
	(6 - 10)	(0 - 2)	(2 - 5)	(-3 - -2)	(3 - 8)	(-1 - 0)	(1 - 2)	(-3 - -1)	
Men	0	0	0	0	0	0	0	0	19.6%
	(0 - 0)	(0 - 0)	(0 - 0)	(0 - 0)	(0 - 0)	(0 - 1)	(0 - 0)	(0 - 0)	
				Singles					
Women	4	-3	2	-5	1	-2	1	-3	19.3%
	(2 - 5)	(-4 - -2)	(1 - 2)	(-6 - -3)	(0 - 2)	(-4 - -1)	(0 - 1)	(-4 - -2)	
Men	0	0	0	-1	0	0	0	0	22.5%
	(0 - 1)	(-1 - 0)	(0 - 0)	(-1 - 0)	(0 - 0)	(0 - 0)	(0 - 0)	(-1 - 0)	
Total	56	-4	28	-33	43	-11	18	-29	15.9%
	(43 - 67)	(-14 - 1)	(21 - 32)	(-40 - -25)	(33 - 53)	(-18 - -6)	(14 - 21)	(-37 - -22)	

Note: Labour supply effects are computed by averaging over the whole sample the 100 simulated transitions, for each of the 100 draws of the utility parameters from the estimated asymptotic distribution of their estimator. The table reports the median values of each distribution and, in brackets, the 90% confidence interval.

Total participation is the number of individuals starting to work after the reform. Variations in working hours are decomposed into change of hours for those previously in employment (intensive margin) and change due to participation effects (extensive margin). In both cases, it is expressed in Full Time Equivalent (FTE) computed as (change in) the total number of hours divided by 40 weekly hours. Share of newly rationed is the share of new participants who are restricted by demand side constraints.

[1] FTE: Full-time equivalents.

Table 14: Labour supply effects of the Employment Bonus (Figures in 1000s)

	Unconstrained Model				Constrained Model				
	New Participation	Working Hours in FTE[1]			New Participation	Working Hours in FTE[1]			Share of newly rationed
	Total	Total	Ext. margin	Int. margin	Total	Total	Ext. Margin	Int. Margin	
Couples (both flexible)									
Women	105	121	92	29	78	103	68	35	18.9%
	(93 - 114)	(110 - 130)	(84 - 99)	(24 - 33)	(71 - 84)	(95 - 111)	(62-74)	(30 - 38)	
Men	62	67	72	-5	29	32	33	-1	22.1%
	(54 - 71)	(56 - 76)	(64 - 80)	(-8 - -2)	(25 - 34)	(25 - 38)	(28 - 38)	(-4 - 2)	
Couples (only one spouse flexible)									
Women	23	28	20	7	13	17	11	6	15.0%
	(17 - 26)	(21 - 30)	(15 - 22)	(5 - 9)	(10 - 16)	(14 - 22)	(8 - 13)	(5 - 8)	
Men	5	5	5	0	2	3	2	1	21.0%
	(2 - 5)	(3 - 6)	(3 - 6)	(0 - 0)	(1 - 3)	(2 - 4)	(1 - 3)	(0 - 1)	
Singles									
Women	70	84	65	19	22	36	21	16	17.8%
	(52- 77)	(63 - 93)	(48 - 73)	(14 - 21)	(16 - 29)	(28 - 47)	(15 - 27)	(12 - 21)	
Men	31	35	32	2	15	20	17	3	19.8%
	(25- 37)	(27 - 41)	(26 - 38)	(1 - 3)	(11 - 21)	(15 - 27)	(12 - 22)	(2 - 6)	
Total	295	339	287	52	159	211	151	62	19.4%
	(243 - 330)	(280 - 373)	(240 - 318)	(36 - 64)	(134 - 187)	(159 - 249)	(116 - 177)	(45 - 76)	

Note: Labour supply effects are computed by averaging over the whole sample the 100 simulated transitions, for each of the 100 draws of the utility parameters from the estimated asymptotic distribution of their estimator. The table reports the median values of each distribution and, in brackets, the 90% confidence interval.

Total participation is the number of individuals starting to work after the reform. Variations in working hours are decomposed into change of hours for those previously in employment (intensive margin) and change due to participation effects (extensive margin). In both cases, it is expressed in Full Time Equivalent (FTE) computed as (change in) the total number of hours divided by 40 weekly hours. Share of newly rationed is the share of new participants who are restricted by demand side constraints.

[1] FTE: Full-time equivalents.

Figure 1: Couples: pre and post reforms budget lines[1]

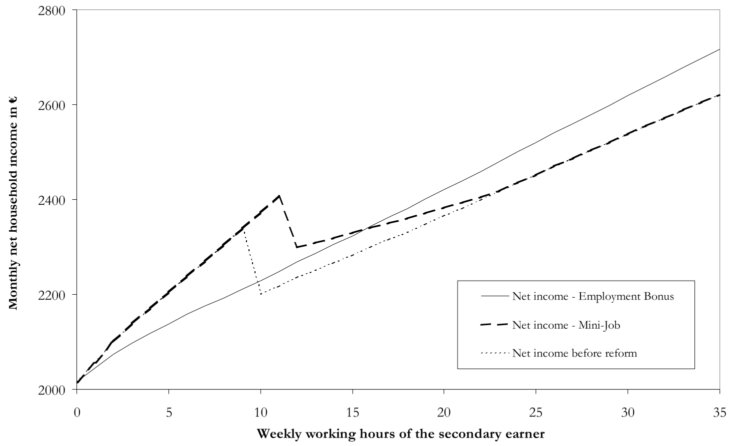
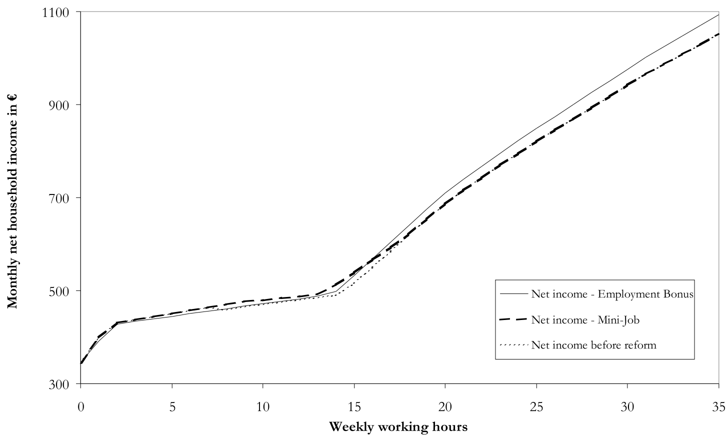


Figure 2: Singles: pre and post reforms budget lines[2]



[1] Remark: No kids, primary earner working 40 hours (median wage: 16.67 Euro/hour), secondary earner: wage: 8 Euro/hour.

[2] Remark: Single person female, no kids, receiving social assistance, no housing benefits, wage: 10 Euro/hour.

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